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Performance of intercrops under bamboo based agroforestry system in Bihar

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ABSTRACT

A study conducted under shaded unutilized land of *dendrocalamus stricutus* plantation at the boundary of crop fields at research Farm of R.A.U., Pusa (Samastipur) showed that turmeric, ginger and dinanath grass produced higher yield near bamboo rows(1-2 m) and it decreased with greater light transmittance away form the rows. The yield trend for finger millet and rice reversed, i.e. grater yield at 12 m distance form the bamboo rows. Thus, cultivation of shade loving crops like turmeric, ginger and dinanath grass are recommended under bomboo grooves in agro-climatic condition of Bihar. Soil analysis showed that pH, organic matter were the least affected. Exchangeable K and exchangeable Ca decreased with increasing distances and available P increased as the distance form bamboo rows increased.

Keyword : Bamboo, intercrop, light intensity.

Bamboo is the world's fastest and strongest growing woody plant. It is basically a household plant species in eastern India. Advantages of bamboo plantation over other tree crops lie in low gestation period, fast growth, recurring annual income, diversified uses and easier regular marketability, all ensuring it as an excellent agroforestry crop. With bifurcation of Bihar state, farmers are adopting all kinds of intercropping systems including bamboo, because ample unutilized interspaces under bamboo plantations provide an opportunity to increase the productivity. Bamboo based forestry, agro-forestry system and homestead plantation has a vast scope to utilize unutilized spaces in and around the bamboo thickets, bamboo stands and bamboo gardens/homestead. Under changing scenario, it will be highly useful to increase the production of shade loving fodder, tubers, vegetables and medicinal plant intercrops in and around bamboo thickets/ stands/ homestead. These intercrops are complementary crops and they do not affect the main bamboo tree in any way in respect of soil moisture, nutrients and sunlight rather they improve phenological and silvicultural features of the bamboo species.

In general the large expanded crown of the bamboo tree species produces striking shade effect on the intercrops, but there are some shade tolerant and shade loving crops which could be successfully grown under shaded area of the bamboo

Table 1 : Light intensity and soil properties as affected by distance from bamboo row

Parameters	Distance from bamboo rows (m)							
	1-3	3-5	5-7	7-9	9-11	11-13	13-15	15-17
Light intensity (W m^{-2})	4.9	7.8	9.6	25.5	75.5	95.8	169.2	180.0
Light transmittance (%)	2.7	4.3	5.3	14.0	42.0	53.0	94.0	100
Soil Properties								
Soil pH	8.05	8.0	8.12	7.9	7.9	8.2	8.2	8.0
Organic matter (%)	1.23	1.16	1.16	1.3	1.4	1.21	1.2	1.21
Available P_2O_5 (kg ha^{-1})	8.4	9.2	9.3	9.4	12.8	14.3	16.5	20.1
Exchange K (kg ha^{-1})	110	94	82	67	55	50	54	50
$Ca Co_3$ (%)	28	22	26	30	25	23	28	24

clumps/ bamboo thickets. The yield of intercrop under agro-forestry system changes with varying light intensity. Saxena *et.al.* (1990) showed positive relation of yield with light intensity and negative relation with tree canopy cover or shade.

The present study therefore, was conducted in agro-forestry research farm, Rajendera Agricultural University, Pusa(Samastipur), Bihar during 2000-2002 to evaluate the shade response of common rainfed intercrops namely turmeric (*Curcuma longa,* L.) ginger (*Zingiber officinale,* Rosco), sita rice (*Oryza sativa* Lin), finger millet (*Eleusive coracona* Lin.) dinanath grass (*Pennisetum pedicellatium,* Trin.)

MATERIALS AND METHODS

Ten to fifteen years old bamboos were growing along the boundary of the Research farm of the RAU, Pusa. Turmeric, ginger, rice (Sita), finger millet and dinanath grass were grown perpendicular to bamboo row with recommended practices. The experiment was laid out in randomized block design with three replications during 2000-2002. Yields of crops were recorded from 2 x 2 m plot size demarcated at the time of harvest. The per cent light transmittance was computed form the light intensity measured by digital Lux meter (No TES 1332) at every 2m distance from the bamboo row as also the intensity in the open (without shade). The light intensity was recorded daily thrice i.e. at 9 am, 12 noon and 3 pm. The observations were taken when intercrops were in maximum foliage density. Soil samples (0-15 cm) were also taken from every 2m distance and analysed for some chemical properties. The yields

Table 2 : Relative crop yield as affected by distance from culms

Crops	Distance from bamboo rows (m)								Max yield (t/ha)	CV (%)
	1-3	3-5	5-7	7-9	9-11	11-13	13-15	15-17		
Turmeric (*Curcuma longa* Lin.)	100	84.4	77.4	62.8	56.2	44.8	3.94	38.2	7.82	32.80
Ginger (*Zingiber officinale Rosco*)	82.4	100.0	98.4	86.2	71.5	58.4	51.2	42.8	8.85	26.45
Rice (Sita) (*Oryza sativa* Lin.)	18.5	36.8	55.4	64.8	85.9	92.8	100.0	100.0	8.94	22.82
Finger millet (*Eleusive coracona* Lin.)	28.4	36.8	32.8	39.7	58.4	86.9	98.2	100.0	1.68	42.54
Dinanath grass (*Pennisetum pedicellatium* Trin.)	89.5	100.0	85.4	62.8	48.5	52.4	42.3	40.5	12.45	34.52

recorded at 2 m intervals were converted into relative yield based on the highest yield obtained for a crop.

RESULTS AND DISCUSSION

Light intensity on a clear day varied between 4.9 Wm^{-2} at 1-3 distance from the row to 180.0 Wm^{-2} at 15 m distance (Table 1) during the cropping period. Per cent light transmission increased as the distance from bamboo grooves increased. There was negligible effect of bamboo grooves on light transmission beyond 13 m distance from the bamboo row. Light transmission was less then 10 per cent of the open up to 7 m distance.

Analysis of soil samples (Table 1) showed that pH and organic matter were the least affected under the canopy of bamboo. Exchangeable K and Ca decreased with increasing distance from the bamboo row. Available P increased with increasing distance due to mineralization of organic P.

Turmeric, ginger and dinanath grass produced 38 to 43 per cent relative yield under full light. Rice and finger millet gave lowest yield near bamboo row and their yields increased with increasing distance from bamboo row (Table 2.). The lower yields of rice and finger millet were due to lesser availability of light near the bamboo rows. The coefficient of variation for yields of shade susceptible crops varied between 23 to 43 percent, whereas it varied for shade loving crops between 26 to 35 per cent. Thus, ginger, turmeric and dinanath grass can be successfully grown on lands near bamboo thickets depending upon grower's choice and economic return.

REFERENCE

Saxena, A.K., Sing, P.K. and Singh, B.P. 1990. Effect of mango (*Mangifera indica* L.) trees on growth and yield of wheat (*Triticum aestivum* L.). *Agro-forestry* : 276-286.